

3. Dredging quantities:

- a. MDE requested an updated bathymetric survey and the updated amounts of material to be dredged in MDE's May 7, 2007 data request. AES responded to the ACOE's July 3 data request for an updated bathymetric survey but did not provide a copy of the full sized survey to MDE. MDE also understands that the updated amount of dredged material is 3.7 million cubic yards, which does not include a bulking factor.**
- b. Provide the amount of material to be dredged including the bulking factor (cubic yards). Include what bulking factor was used and how it was calculated. Include all important references and documentation to support your response.**
- c. Provide the amount of material after processing through the dredged material recycling facility (cubic yards). Include all important references and documentation to support your response.**

Response:

- 3.a.** Attached are copies of bathymetric survey results from the Barletta Willis Incorporated ("BWI") post-dredge survey completed in January of this year. Attachment 3a – Figure 18 provides the depth soundings and Attachment 3a – Figure 19 provides the depth contours. The bathymetric survey results cover the entirety of the proposed AES dredge area with the exception of less than 2.5 acres located on the northwest margin of the proposed turning basin and a smaller portion along the pier shoreline (see Attachment 3a - Figure 19). AES supplemented the areas not covered by the 2007 BWI survey with information from GEODAS. Attachment 3a – Figure 20 combines the 2007 BWI depth contour survey data with the GEODAS survey data for those areas proposed to be dredged by AES that were not included in the 2007 BWI survey.

The three figures provided in Attachment 3a are in 8.5" by 11" format. While not phrased as a request for full-sized surveys, MDE's Comment 3a implies that MDE may be interested in receiving such full-sized versions of the figures. Per email correspondence dated August 27-28, 2007, AES committed to provide two full-sized surveys to MDE via overnight delivery with receipt by MDE on August 29, 2007.

It is AES's intention to complete a survey both pre- and post-dredge activities to confirm actual amounts removed during the construction of the Project. This updated survey information will be provided to MDE once available.

The updated volumes of dredged materials are further discussed in the response to MDE Comment 3b.

- 3.b.** The "in-place" estimate of material to be dredged remains 3.7 million cubic yards. The bulking factor for mechanically dredged silt (freshly deposited to consolidated) ranges from 1.0 to 1.4 (Bray, 1979). The bulking factor for mechanically dredged sand ranges from 1.05 to 1.35 (Bray, 1979). The bulking factor from mechanically dredged clay ranges from 1.0 to 1.25 (Bray, 1979). It should be noted that these bulking factors were determined "in the scow" after dredging only.

Detailed volume estimates of each type of material that will be generated as a result of this project are being developed. Using a conservative average bulking factor of 1.2 would result in approximately 4.4 million cubic yards of mechanically dredged material, or “scow yards”.

Bray, R. N., “Dredging, A Handbook for Engineers,” 1979

- 3.c.** While the response to 3.b. discusses bulking in the scow (or scow yards) the other phases of the dredging operation, including settling in the scow, dewatering, debris removal, processing of the dredged material (including addition of additives), and placement of the dredged material, each impact the bulking factor at various stages of the process.

The processing of the dredged material, which includes addition of cementitious additives, induces a hydration reaction within the dredged material, thereby adsorbing pore water, decreasing pore space, and minimizing the effective bulking rate. Based on information obtained from processors in New Jersey DMRFs, the measured unit weight (wet bulk density) of sediment *in-situ* averages approximately 78 to 84 pounds per cubic foot. Following processing at a DMRF with 8 percent by weight cement additive, the wet bulk density of the processed dredged material averages approximately 90 to 100 pounds per cubic foot. This would indicate minimal to no increase in volume (bulking), if not a net shrinkage, in the processed dredged material versus the in-place sediment volume.

Further densification of the material takes place during placement activities. In an upland beneficial use project completed by Clean Earth Dredging Technologies, Inc. of Hatboro, Pennsylvania, calculations from pre- and post-dredge hydrographic surveys showed that 79,040 cubic yards of sediment were removed by mechanical dredging methods from the Claremont Channel in Jersey City, New Jersey. Clean Earth processed this raw dredged material through its DMRF, also located on the Claremont Channel, in the same manner as is proposed for this project. (Note: the Claremont Channel DMRF is essentially identical to the DMRF proposed at Sparrows Point). The processed dredged material was transported to a neighboring property for use as grading fill material at a golf course development. A pre- and post-land construction survey revealed that a total of 85,650 cubic yards of material were measured in place at the beneficial use site. These volumes result in a bulking factor of 1.08.

The real-world bulking factor of 1.08 confirmed above is consistent with the conservative estimate provided by AES in Response 3.b and the bulking factors described by Bray that are noted in Response 3.b.